

Claims

I Claim:

1. A method for breaking viscosity of aqueous fluids gelled with polysaccharides comprising
adding to an aqueous fluid gelled with at least one polysaccharide, at least one low molecular weight polyol; and
adding to the aqueous fluid in any sequence an effective amount of a metal ion to catalyze the polyol to break down the polymer backbone directly, where the metal ion is selected from the Periodic Table Groups VIB, VIIB, VIII, IB and IIB.
2. The method of claim 1 where in adding the polyol, the polyol has at least one hydroxyl group on two adjacent carbon atoms and is selected from the group consisting of monosaccharides and disaccharides, and acid, acid salt, alcohol, alkyl and amine derivatives of these saccharides.
3. The method of claim 1 conducted in the absence of an oxidizer breaker or an enzyme breaker.
4. The method of claim 1 further comprising raising the pH of the aqueous fluid.
5. The method of claim 4 where the pH of the aqueous fluid is raised with a compound selected from the group consisting of an alkali metal hydroxide, alkali metal carbonate, bicarbonate, sesquicarbonate, and mixtures thereof.
6. The method of claim 1 where in adding the polyol, the polyol is selected from the group consisting of mannitol, sorbitol, xylitol, glycerol, glucose, fructose,

maltose, lactose, tagatose, psicose, galactose, xylose, allose, ribose, arabinose, rhamnose, mannose, altrose, ribopyranose, arabinopyranose, glucopyranose, gulopyranose, galatopyranose, psicopyranose, allofuranose, gulofuranose, galatofuranose, glucosamine, chondrosamine, galactosamine, ethyl-hexo glucoside, methyl-hexo glucoside, aldaric acid, sodium aldarate, glucaric acid, sodium glucarate, gluconic acid, sodium gluconate, glucoheptonic acid, sodium glucoheptonate, and mixtures thereof.

7. The method of claim 1 where in adding the polyol, the amount of polyol added ranges from about 0.1 to about 30.0 pptg (about 0.012 to about 3.6 kg/m³) based on the total volume of fluid.
8. The method of claim 1 further comprising subjecting the polymer and the polyol to heat, where the temperature ranges from about 80 to about 250°F (about 27 to about 121°C).
9. The method of claim 1 where in subjecting the polymer and the polyol to heat for an effective period of time, the period of time ranges from about 0.5 to about 48 hours.
10. The method of claim 1 where the metal of the metal ion is selected from the group consisting of molybdenum, manganese, iron, cobalt, copper, zinc, chromium, nickel, palladium, and combinations thereof.
11. The method of claim 1 where the metal ion concentration in the aqueous fluid ranges from about 0.01 to about 100.0 ppm.
12. The method of claim 1 where the metal ion is complexed or chelated prior to adding.

13. The method of claim 1 where the metal ion is a component of an organometallic complex.
14. The method of claim 1 where the metal ion is a component of an inorganic compound.
15. The method of claim 1 where the metal ion is plated onto a particle surface or distributed within a synthetic porous particle.
16. The method of claim 1 where the metal ion is encapsulated or pelletized.
17. The method of claim 1 where the polysaccharide is crosslinked.
18. The method of claim 17 where the polysaccharide is crosslinked with an ion selected from the group consisting of borate ion, zirconate ion, titanate ion, and combinations thereof.
19. A method for breaking viscosity of aqueous fluids gelled with polysaccharides comprising
 - adding to an aqueous fluid gelled with at least one polysaccharide, at least one low molecular weight polyol, where the polyol has at least one hydroxyl group on two adjacent carbon atoms and is selected from the group consisting of monosaccharides and disaccharides, and acid, acid salt, alcohol, alkyl and amine derivatives of these saccharides, where the amount of polyol ranges from about 0.1 to about 30.0 pptg (about 0.012 to about 3.6 kg/m³) based on the total volume of fluid; and

adding to the aqueous fluid in any sequence an effective amount of a metal ion to catalyze the polyol to break down the polymer backbone directly, where the metal ion is selected from the Periodic Table Groups VIB, VIIB, VIII, IB and IIB.

20. The method of claim 19 conducted in the absence of an oxidizer breaker or an enzyme breaker.

21. The method of claim 19 where in adding the polyol, the polyol is selected from the group consisting of mannitol, sorbitol, xylitol, glycerol, glucose, fructose, maltose, lactose, tagatose, psicose, galactose, xylose, allose, ribose, arabinose, rhamnose, mannose, altrose, ribopyranose, arabinopyranose, glucopyranose, gulopyranose, galatopyranose, psicopyranose, allofuranose, gulofuranose, galatofuranose, glucosamine, chondrosamine, galactosamine, ethyl-hexo glucoside, methyl-hexo glucoside, aldaric acid, sodium aldarate, glucaric acid, sodium glucarate, gluconic acid, sodium gluconate, glucoheptonic acid, sodium glucoheptonate, and mixtures thereof.

22. The method of claim 19 further comprising subjecting the polymer and the polyol to heat, where the temperature ranges from about 80 to about 250°F (about 27 to about 121°C).

23. The method of claim 19 where in subjecting the polymer and the polyol to heat for an effective period of time, the period of time ranges from about 0.5 to about 48 hours.

24. The method of claim 19 where the metal of the metal ion is selected from the group consisting of molybdenum, manganese, iron, cobalt, copper, zinc, chromium, nickel, palladium, and combinations thereof

25. The method of claim 19 where the metal ion concentration in the aqueous fluid ranges from about 0.01 to about 100.0 ppm.
26. The method of claim 19 where the metal ion is complexed or chelated prior to adding.
27. The method of claim 19 where the metal ion is a component of an organometallic complex.
28. The method of claim 19 where the metal ion is a component of an inorganic compound form.
29. The method of claim 19 where the metal ion is plated onto a particle surface, or distributed within a synthetic porous particle.
30. The method or claim 19 where the metal ion is encapsulated or pelletized.
31. An aqueous fluid comprising:
at least one polysaccharide gel;
at least one metal ion in an amount effective to catalyze:
at least one polyol, in an amount effective to eventually reduce the pH of
the fluid and break down the polysaccharide backbone directly; and
water.
32. The fluid of claim 31 where the polyol has at least one hydroxyl group on two adjacent carbon atoms and is selected from the group consisting of monosaccharides and disaccharides, and acid, acid salt, alcohol, alkyl and amine derivatives of these saccharides.

33. The fluid of claim 31 having an absence of an oxidizer breaker or an enzyme breaker.
34. The fluid of claim 31 further comprising a compound selected from the group consisting of an alkali metal hydroxide, an alkali metal carbonate, bicarbonate, sesquicarbonate, and mixtures thereof to raise the pH to at least 8.0.
35. The fluid of claim 31 where the polyol is selected from the group consisting of mannitol, sorbitol, xylitol, glycerol, glucose, fructose, maltose, lactose, tagatose, psicose, galactose, xylose, allose, ribose, arabinose, rhamnose, mannose, altrose, ribopyranose, arabinopyranose, glucopyranose, gulopyranose, galatopyranose, psicopyranose, allofuranose, gulofuranose, galatofuranose, glucosamine, chondrosamine, galactosamine, ethyl-hexo glucoside, methyl-hexo glucoside, aldaric acid, sodium aldarate, glucaric acid, sodium glucarate, gluconic acid, sodium gluconate, glucoheptonic acid, sodium glucoheptonate, and mixtures thereof.
36. The fluid of claim 31 where the polyol is selected from the group consisting of fructose, glucose, lactose, maltose, sorbitol, or alkyl glucoside.
37. The fluid of claim 31 where the amount of polyol ranges from about 0.1 to about 30.0 pptg (about 0.012 to about 3.6 kg/m³) based on the total volume of fluid.
38. The fluid of claim 31 where the amount of metal ion ranges from about 0.01 to about 100.0 ppm based on the total volume of fluid.
39. The fluid of claim 31 where the polysaccharide is crosslinked.

40. The fluid of claim 31 where the polysaccharide is crosslinked with an ion selected from the group consisting of borate ion, zirconate ion, titanate ion, and combinations thereof.